Date: January 23, 2002

To: DDW Staff

Through: Robert B. Taylor, P.E., Director, Division of Drinking Water

From: M/DBP Team

Subject: Water - Procedure - Plan Processing - Review of Changes to Disinfection

Re: Working Memo 819

Working Memo 819 addresses the procedures for conducting disinfection profiles and developing a benchmark as required by the Interim Enhanced Surface Water Treatment Rule (IESWTR). After the benchmark has been developed the next question is, what does the waterworks do with the information and how is an alternate benchmark established?

References:

IESWTR

§141.172(c) Disinfection benchmarking.

(1) Any system required to develop a disinfection profile under the provisions of paragraphs (a) and (b) of this section and that decides to make a significant change to its disinfection practice must consult with the State prior to making such change. Significant changes to disinfection practice are:

(i) Changes to the point of disinfection;

(ii) Changes to the disinfectant(s) used in the treatment plant;

(iii) Changes to the disinfection process; and

(iv) Any other modification identified by the State.

(2) Any system that is modifying its disinfection practice must calculate its disinfection benchmark using the procedure specified in paragraphs (c)(2)(i) through (ii) of this section.

(i) For each year of profiling data collected and calculated under paragraph (b) of this section, the system must determine the lowest average monthly Giardia lamblia inactivation in each year of profiling data. The system must determine the average Giardia lamblia inactivation for each calendar month for each year of profiling data by dividing the sum of daily Giardia lamblia of inactivation by the number of values calculated for that month.

(ii) The disinfection benchmark is the lowest monthly average value (for systems with one year of profiling data) or average of lowest monthly average values (for systems with more than one year of profiling data) of the monthly logs of Giardia lamblia inactivation in each year of profiling data.

(3) A system that uses either chloramines or ozone for primary disinfection must also calculate the disinfection benchmark for viruses using a method approved by the State.

(4) The system must submit information in paragraphs (c)(4)(i) through (iii) of this section to the State as part of its consultation process.

(i) A description of the proposed change;

(ii) The disinfection profile for Giardia lamblia (and, if necessary, viruses) under paragraph (b) of this section and benchmark as required by paragraph (c)(2) of this section; and

(iii) An analysis of how the proposed change will affect the current levels of disinfection.

State Regulations:

§12 VAC 5-590-190 - Permits

§12 VAC 5-590-200 - Procedure for obtaining a construction permit

EPA Guidance Manual

"Disinfection Profiling and Benchmarking Guidance Manual" dated August 1999 prepared by the USEPA.

5.3 Calculations to Identify Modification Impact

To assess the impact of modifications on current log inactivation, systems need to perform several additional benchmarking calculations. Specifically, water systems should calculate “modification benchmarks,” based on the current operating conditions before the process change is made. These modification benchmarks should be compared to the original benchmark to evaluate the expected inactivation level of the modified disinfection practice.

The steps to calculate these modification benchmarks are as follows:

- Identify the lowest average months from the original profile (i.e., the one to three months that were averaged to calculate the original benchmark).
- Using the temperature, pH, and contact times (unless the modification significantly changes these values) from the original profile calculations, systems calculate the daily log inactivation for *Giardia* (and/or viruses) for each day of the month under the proposed modification (i.e., for conditions after the modification is complete). The water system will need to assume reasonable values for the disinfectant residuals. It may also need to calculate or estimate contact times, or identify new points of disinfectant residual sampling to reflect the modification.
- Calculate the average log *Giardia* and/or virus inactivation for the months identified in the first bullet.
- Calculate the average of the monthly values. This value is the modification benchmark.

- Compare the original benchmark to the modification benchmark. If the modification benchmark is greater than the original benchmark, the modification will likely be acceptable after consultation with the State. Modification benchmarks lower than the original benchmark should be evaluated by the State to determine whether the resulting level of disinfection is still considered adequate based on source water quality and watershed conditions (discussed further in Chapter 6).

  The system and State should discuss the reasons for any modification and whether better options exist, and assess the modification's impact on log inactivation. The State and the system should jointly assess the impact that the proposed modification will have on log inactivation levels of *Giardia* and/or viruses.

6. Alternative Disinfection Benchmark

Some systems may not be able to meet Stage 1 DBPR MCLs while maintaining their existing disinfection practices and benchmark. Under these conditions, the system must consult with the State to discuss appropriate compliance strategies, including an alternative disinfection benchmark. The alternative disinfection benchmark would be lower than the calculated disinfection benchmark, allowing the utility greater flexibility to achieve compliance with DBPR MCLs while still not significantly compromising microbial protection. However, the alternative disinfection benchmark must not be lower than the disinfection requirements of the SWTR.

Conclusions:

The IESWTR applies to waterworks serving 10,000 or more people using conventional filtration or direct filtration to treat surface water or groundwater under the direct influence of surface water. Not all of these waterworks were required to complete a disinfection profile and establish a benchmark because they were able to meet the TTHM and HAA5 levels established in the Rule. (Refer to WM819 for further details.)

Those waterworks required to complete the disinfection profile and establish a benchmark, are to keep this data on file until it is needed to consult with the Division of Drinking Water (DDW) about a change in disinfection practice. The waterworks will formally present the benchmark data to the DDW Field Offices for evaluation and discuss the proposed modifications. They may proceed with the modifications under the following conditions:

1. The modifications result in a log inactivation that meets or exceeds the benchmark.
2. The modifications result in a log inactivation lower than the benchmark but above the levels required in all of the following treatment techniques:
   a. At least 99.9 percent (3-log) removal and/or inactivation of Giardia lamblia cysts between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer; and
   b. At least 99.99 percent (4-log) removal and/or inactivation of viruses between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream before or at the first customer, and
   c. At least 99 percent (2-log) removal of Cryptosporidium between a point where the raw water is not subject to recontamination by surface water runoff and a point downstream

before or at the first customer for filtered systems, or Cryptosporidium control under the watershed control plan for unfiltered systems.

3. A formal approval shall be provided in a manner consistant with current polices and procedures.

§141.172(c)(3) of the IESWTR requires any waterworks conducting the disinfection profile and using chloramines or ozone for primary disinfection to calculate the disinfection benchmark for viruses. Tables C-11 and C-13 found in Appendix C of the EPA Guidance Manual provide CT values for inactivation of viruses by chloramine or ozone. If a waterworks is using or plans to use chloramines or ozone as the primary disinfectant then they must establish the disinfection benchmark for viruses using the same procedures as was used to establish the disinfection benchmark using chlorine.